THE PETROLEUM INDUSTRY IN INDIANA IN 1908.

BY

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The history of the petroleum industry in Indiana for the year 1908 can be written in few words, chief among which is retrogression. The number of bores sunk and the output in barrels were both less than in any year since 1893, when the industry was in its infancy; while the number of former producing wells abandoned was far greater than ever before, there being more than five wells abandoned for every bore put down.

This great decline was not due to the lack of productive territory, for large areas which undoubtedly contain oil in commercial quantities lie along the borders of the former producing Trenton rock area, or in the intervals between the wells within its bounds. Nor was the decline due to the price of the product, which averaged higher than in any year since 1904. Rather was it due to the absence of the principal operators formerly producing in Indiana, they having migrated to Illinois and other fields, where the output per well is much greater than in this State. The average oil operator is ever on the lookout for a "gusher" or big producer, and quickly abandons a territory where the wells are light, even though they are lasting and the profits fair, for one which promises a bigger yield per well, though his final profits are often less. Added to this absence of the leading operators were three other contributory causes of the decline in operations, viz.: (a) lack of investive capital, due to the monetary panic of the year; (b) the excitement and unrest due to a presidential campaign; (c) the unprecedented drought of the summer and autumn months which brought about a lack of water for drilling and pumping in many portions of the field. These were the reasons why Indiana's once chief mineral resource was outranked in value by three or four others in the year just past.

THE OIL PRODUCING ROCKS OF INDIANA.

Crude petroleum or "rock oil" is known to occur in commercial quantities in three geological formations or horizons of the State, viz.: *The Trenton Limestone* of the Lower Silurian Age; the *Cor-*

niferous Limestone of the Devonian Age and the *Huron Sandstone* of the Subcarboniferous Age. In each of these it occurs in quantity only where the rock is sufficiently porous to form a holding or storage reservoir. Moreover, this reservoir must be immediately overlain by an impervious cover of shale and must be located in the flanks or crest of an anticline. Where these three conditions exist in connection with the geological formations above mentioned, oil in commercial quantities *may be* found. Wherever any one of the three is absent, it will never be found.

It is from the Trenton limestone formation, in an area northeast of the center of the State, that the great bulk of the crude petroleum has been and is being produced.* The different counties which are in part underlain by this productive area will be mentioned in order, and a very brief statement of the industry for the year within their bounds be given.

THE TRENTON ROCK OIL FIELDS OF INDIANA FOR THE YEAR 1908.

Grant County.—This county five years ago headed the list in the Trenton field in oil development, but in 1908 the great majority of the new bores sunk were small producers, starting at less than ten barrels, many of them at only three to five barrels each. The lack of gas for fuel and, in the latter part of the season, of water for pumping, greatly retarded active operations.

The best wells sunk in the county during the year were in Van Buren Township, which comprises one of the oldest and best productive areas of the State, every one of its 36 square miles having yielded oil in quantity. Bores on the Ballhofer lease in the southwest quarter of section 5, on the Kily farm in section 9 and on the Reed farm in section 26 started at 80 to 100 barrels each. These were on undrilled locations in the midst of wells sunk several years ago, and prove that a bore in good territory only drains a few acres in its immediate vicinity. Another bore of a similar kind was No. 13 on the Creviston lease in section 1, Washington Township, which pumped 80 barrels the first day.

The only new territory opened up in the county during the year was in the southern half of Monroe Township, where a number of small producers were finished on leases which had hitherto yielded only gas. Some of the tests in this area, however, came in dry, two of these being in the southwest quarter of section 28. A few

*For a map of this area and a detailed report on the oil industry therein see the paper "The Petroleum Industry in Indiana in 1906" by W. S. Blatchley, in the Thirty-first Annual Report of this Department, pp. 429-558.

fair producing test bores were also finished on sections 33 and 36, Mill Township.

Altogether but 90 bores were sunk in the county during the year, seven of which, or 7.7 per cent, were dry. The average initial output of the producing wells was nine barrels each, or a gain of 1.5 barrels over that of 1907. Much of the productive area in the county yields heavy salt or "blue lick" water, and the gas supply has become so meager that most of the oil must be pumped with steam engines using coal for fuel. Small producing wells cannot, therefore, be pumped with profit, and as a result no less than 657 of them were abandoned in the county during the year; the iron in most of them being pulled and shipped to more productive territory in other States. Should the Illinois and other fields fall off greatly in area and a dearth of new territory be lacking, many of the former operators of Grant County would doubtless return and start new work in the undrilled intervals between the older wells of its area. However, the county will never be what it was in the halcyon days of 1903, when the cough of the gas engine and the churn of the drill were heard on every side, and 1,383 bores, or nearly seven times as many as were sunk in the entire State in 1908, were put down within its bounds.

Huntington County.—Only about 45 square miles of this county, immediately bordering the Grant County field, on the north, have yielded oil in commercial quantity. While this territory has never produced any big wells, it has been profitable to operate, as very few bores have been dry, and the production has held up remarkably well for an area on the borders of a productive field. Only 17 bores were sunk in the county during the year, two of which were dry. The others were mostly small producers, the best one, in the northwest quarter of section 34, Jefferson Township, starting at 70 barrels. The average initial output was 10.3 barrels, as against 10.6 in 1907. No new territory was opened up and 165 wells were abandoned. Of the 993 bores sunk in the county within the past six years, but 26, or 2.6 per cent, have been dry, so that the oil business there is much less of a gamble than in most other sections of the United States.

Wabash and Miami Counties.—But one bore was sunk in the Rich Valley pool during the year, and it was soon abandoned. The Rich Valley and Peru pools together yielded a total of only 13,358 barrels for the year.

Blackford County.—The northern part of this county is one of the oldest producing territories in the State, and in the past has

yielded many good wells. During the year but 40 bores were sunk, nine, or 22.5 per cent, of which were dry. The average initial output was only 8.5 barrels. However, the record, except in the percentage of dry holes, was better than in 1907, when only 22 bores were sunk, averaging 7.4 barrels each. During the year 319 old wells were abandoned. No new territory was opened up, several tests coming in dry or so nearly so that they were not pumped. In many localities in both this and Wells County the iron from the old wells was painted and piled up to use in future development, there being thousands of available locations which in the future will yield much oil.

Wells County.—This county also embraces some of the oldest and most productive territory in the State. Many of the first wells drilled were sunk only a few feet into Trenton and the undrilled intervals offer inducements for future operators. But 70 bores were sunk in the county during the year, four of which were dry. The average initial output of the producers was 8.1 barrels as against 8.9 barrels in 1907. The best well drilled was on the southeast quarter of section 12, Jackson township, it yielding 110 barrels the first day. Other good ones in the same township starting at more than 50 barrels were on the Lee farm in section 29 and the Spaulding lease in section 24. In Chester Township the Gruver farm in section 17 produced two which started at 80 and 50 barrels each. These were all among old wells which had been yielding for ten years and more.

Many of the first producers in this and Nottingham Townships have ceased to yield, no less than 610 having been abandoned in the county during the year, as against 224 in 1907.

But few important sales of oil territory have been made in the Indiana Trenton rock field in recent years, investors putting their spare cash in the Illinois and other territory. One sale of 700 acres and 72 producing wells in Jackson and Chester townships was made for $30,000. The daily net production was 65 barrels, and five years ago the property would have brought as many thousand dollars.

Adams County.—Only the southern third of this county has in the past produced petroleum in paying quantities, and here as elsewhere there was little doing during the year. Only 15 new bores were sunk, while 82 old wells were abandoned. Of the new ones, two, or 13.3 per cent, were dry, while the average initial output of the others was 13.6 barrels, as against 5.7 barrels for 1907. However, the greatest part of this gain was due to one big well or "gusher" on the H. M. Fogle farm in section 32, Jefferson Town-

ship, which started at 150 barrels. This well was located in old territory which formerly furnished a number of good producers, but which in late years had produced only small pumpers.

Such a well as this in the midst of numerous small ones, starting at 5 to 15 barrels, puts new hope in the heart of the operator, and goes to prove that each new bore, even though surrounded by well drilled territory, is almost as much of a gamble as the rankest wildcat, far outside of productive limits. It is this element of chance, ever present, which adds to the excitement and pleasure of the oil industry, and so tends to keep the beginning operator a life-long devotee before its shrine.

Jay County.—This county again led all others in the State in new work, 107 bores, or more than one-fourth of the total sunk in the Trenton rock area, having been drilled within its bounds. Of these 25, or 23.3 per cent, were dry. This large percentage was due to a number of wildcat bores put down in search of new territory, the majority of which came in dry. The best of the yielding bores were located on undrilled locations within well defined, but old productive territory in Bear Creek Township, a part of which had been abandoned. Some of the best of these which came in at 50 to 100 barrels each were located on the Armentrout and Walters farms in sections 7 and 9, and on the Beal lease in section 8. No. 11 on the latter lease, situated in the midst of the good ones, came in dry, as did also a test on the Bone farm, in the northeast quarter of section 9, while another test bore on the Downing lease in the southeast of 18 resulted in a light gas producer.

About the only extension to the previously defined field in the county was opened up by the Fulton Drilling Company in the west half of section 34, and the southeast quarter of 33, Bear Creek Township. On the Aiman farm this company was drilling for gas, and having drilled below the gas-bearing stratum discovered an oil pay at 30 feet in Trenton, which resulted in a production of 40 barrels initial output. Four more producing wells starting at 20 to 60 barrels each were afterward drilled on the same lease.

On the Hughes tract in section 33, three or four good wells were also bored, No. 2 of which started at 120 barrels, while on the Prilliman tract just east, No. 3 was of the same caliber. The top of Trenton in a big gas well on this farm was 1,024 feet below the surface; while in the oil wells on it and adjoining leases it was 1,027 to 1,042 feet below. The best of these strikes were made near the close of the year, and quite an area of new territory may be opened up in this vicinity next season.

In Wayne Township tests in the northeast quarter of sections 2

and 5, adjoining the new territory in Bear Creek, resulted in 10- to 15-barrel wells, showing that the productive area may extend southward toward Portland. A number of the older wells in the county, especially in Jackson and Penn townships, were abandoned during the year, but the total was only 68, being proportionally much less than in any of the former producing counties. At the present time the county offers more chances of success to the prospective operator than any other within the Trenton rock area.

Randolph County.—The number of bores sunk in this county for the year was but five, the same as in 1907. Of these one was dry, while the others had an average initial output of only 8.7 barrels.

A test on the Deeds farm in section 21, Stony Creek Township, started at only five barrels, while others in the vicinity of the former great producing Cecil pool did not exceed 15 barrels. Forty-five wells were abandoned in Randolph County during the year.

In Jackson Township, in the eastern part of the county several small gas wells were drilled during the year, some of them showing a small amount of oil. Just across the State line, in Darke County, Ohio, a number of good gas wells, and five or six small oil producers, have been recently developed, and a paying oil territory may in the near future be opened up in this vicinity.

Delaware County.—Nowhere in the State has the petroleum industry shown greater retrogression during the past four years than in Delaware County. The original home of the deep pay bores, it enjoyed a boom during 1904 and 1905 which resulted in a big producing but short-lived pool. Backing up an abundance of oil was an inexhaustible flow of salt water which drowned out many of the best wells while yet in their prime. The early operators who were fortunate enough to hold big leases and sell them before the water made its appearance made some money, but the purchasers lost hundreds of thousands of dollars by the quick flooding of the field.

The rise and fall of the industry in the county is graphically shown by the number of producing wells and dry holes sunk during the years 1903 to 1908, inclusive, as follows:

Year.	Producing Wells.	Dry Holes.	Average Initial Output, Bbls.
1903	74	48	20.7
1904	831	121	44.4
1905	570	83	32.6
1906	141	39	33.2
1907	49	16	14.6
1908	15	14	20.8

The best of the 15 producing wells drilled in the county during the year was on the Pogue farm in the southwest quarter of section 23, Delaware Township, in territory marked as fair on the last oil map. It was finished in May and pumped 175 barrels the first 24 hours. Another one which started at 100 barrels was completed on the Goings lease in section 15. These two increased the average initial output for the year more than six barrels per well.

In Hamilton Township a 100-barrel well was drilled on the Wilson farm in section 25, in territory already marked as good, but the next one on the same lease produced only salt water. On the Campbell lease in section 35, Liberty township, two bores resulted in a 90-barrel producer and a light gas well. A test in the northeast quarter of section 35, Niles Township, developed only a dry hole. The number of wells abandoned in the county during the year was 205, or 125 less than in 1907.

The following table gives the output of the Muncie-Selma-Parker field by months, for the year 1904 to 1908, inclusive:

Number of Barrels of Oil Piped or Shipped from the Muncie-Selma-Parker Oil Field in 1904 to 1908, Inclusive, by Months.

	1904.	1905.	1906.	1907.	1908.
January	42,835	358,483	182,927	74,970	45,243
February	33,081	282,773	143,410	70,681	35,125
March	40,869	321,650	145,442	72,206	41,866
April	46,504	305,129	143,823	72,139	42,333
May	73,162	320,287	151,860	76,545	44,005
June	115,048	311,030	143,309	65,516	45,488
July	176,624	277,177	134,479	68,111	45,662
August	240,050	255,854	132,482	59,618	41,281
September	311,098	230,970	107,129	54,434	35,561
October	384,380	218,052	113,151	53,985	37,256
November	356,173	210,724	90,742	49,603	31,748
December	382,302	200,163	85,905	50,340	32,359
Totals	2,202,126	3,292,292	1,574,659	768,148	477,927

Madison County.—Operations were practically at a standstill in this county in 1908, but two bores having been sunk. They were both on the Gray lease, section 22, Monroe Township, and started at respectively five and ten barrels each, the latter one yielding also a large amount of salt water. This farm is located east of Alexandria in a region which has produced only light or fair wells and much blue lick water. Five old wells were abandoned in the county during the year, and the total shipment amounted to only 108 barrels.

Hamilton County.—The pools in the vicinity of Olio and Horton in this county continued to yield small quantities of oil, but only one new well was drilled. It was No. 5 on the J. F. Horton lease in Washington Township, and its initial output was only 10 barrels. There was produced in the Olio pool and shipped from Noblesville during the year 4,001 barrels, while the Horton pool yielded for the same time only 508 barrels.

Marion County.—All the wells in the old Broad Ripple pool have been abandoned and plugged and there was not a barrel of oil produced in the county during the year.

Statistics of the Indiana Trenton Rock Petroleum Industry for 1908.

For four years in succession the output of Trenton rock petroleum in Indiana has been on the decline. The loss in 1905 was 388,592 barrels, or 3.4 per cent of the output of the previous year; in 1906 it was 3,129,613 barrels, or 28.8 per cent; in 1907 the loss was 2,803,717, or 36.1 per cent, while in 1908 it was 1,749,062 barrels, or 35.3 per cent. The cause for this great decline has been chiefly due to a loss in the number of new bores sunk, the operators seeking other fields in Illinois and Oklahoma, where the prospective outlook was better.

The fluctuation in price during 1908 was very little. Starting the year at 89 cents, the maximum price in 1907, it held this figure until February 24, when it was advanced to 94 cents and again on February 28 to 99 cents, the maximum, which price it held to the end of the year. The average price for the year, taking both days of time and amount received into consideration, was 97¼ cents, as against 88 2-5 cents in 1907 and 88 3-5 cents in 1906. The price of practically one dollar per barrel, which held for ten months of the year, should have stimulated active drilling inside of well defined territory, as it has been proven that the average cost of production in the Indiana field is less than 40 cents per barrel.

The total production of Trenton rock oil in Indiana in 1908 was 3,210,036 barrels, which at the average price of 97¼ cents, had a value of $3,121,639, this sum being $1,262,212, or 28.7 per cent less than was received by the producers in 1907.

The first of the following tables gives a complete record of the monthly production of petroleum from the Trenton limestone fields of Indiana for the eighteen years beginning January 1, 1891, and ending December 31, 1908. This does not include the amount used

in the field for fuel and other purposes, or that wasted by the burning of tanks or the leaking of pipes, but only that shipped or piped by the companies who purchase the oil from the operators. The second table shows the annual production, the average yearly price and the total value by years for the same period.

I. TOTAL PRODUCTION OF TRENTON LIMESTONE PETROLEUM IN INDIANA FROM 1891 TO 1909 BY MONTHS.

(Barrels.)

MONTH.	1891.	1892.	1893.	1894.	1895.	1896.
January	6,171	15,841	111,824	259,000	300,568	365,582
February	5,981	18,946	96,025	232,107	230,559	241,743
March	5,159	24,794	134,549	282,376	310,303	386,586
April	4,973	26,184	146,493	287,330	352,077	395,032
May	5,757	31,033	186,939	321,502	397,001	417,963
June	8,136	40,888	209,616	333,479	403,569	434,167
July	10,809	49,203	241,666	327,349	434,376	422,968
August	11,603	56,109	248,353	345,031	420,132	407,238
September	16,500	66,034	245,615	319,588	409,169	415,675
October	19,029	95,699	252,568	339,424	393,153	394,283
November	20,801	129,270	245,607	304,030	373,789	337,331
December	21,715	144,067	236,038	337,450	361,436	362,164
Totals	136,634	698,068	2,335,293	3,688,666	4,586,132	4,680,732

MONTH.	1897.	1898.	1899.	1900.	1901.	1902.
January	290,746	317,014	297,291	353,451	425,140	554,038
February	309,922	272,780	220,440	302,493	384,735	460,073
March	341,961	325,301	290,257	364,590	432,922	573,412
April	328,779	310,034	325,774	381,804	447,261	579,711
May	340,023	311,208	344,831	426,363	482,118	635,752
June	369,803	320,477	334,282	446,492	481,807	633,452
July	375,249	314,861	329,086	437,087	506,065	696,911
August	371,921	332,777	347,621	466,127	523,106	697,040
September	362,528	326,264	332,283	418,716	519,087	672,611
October	408,179	319,490	326,781	467,521	532,960	725,973
November	430,958	300,644	326,802	406,684	510,788	656,457
December	423,069	300,457	332,266	441,347	479,485	650,131
Totals	4,353,138	3,751,307	3,807,714	4,912,675	5,725,474	7,535,561

MONTH.	1903.	1904.	1905.	1906.	1907.	1908.
January	651,355	714,594	1,038,324	759,518	471,926	314,490
February	568,789	664,058	804,100	657,201	438,332	253,016
March	724,969	797,133	1,037,320	678,788	447,174	285,337
April	680,921	804,121	964,242	684,810	457,286	293,333
May	751,348	851,071	1,011,859	701,766	466,270	293,468
June	809,438	940,391	1,011,965	692,390	423,333	288,516
July	831,005	998,229	937,960	684,056	446,740	284,400
August	838,615	1,084,560	916,803	673,721	410,881	265,057
September	857,117	1,104,771	840,804	563,100	366,752	255,722
October	873,160	1,139,000	791,881	607,178	369,255	238,717
November	778,323	1,098,832	765,078	547,134	334,146	215,204
December	796,291	1,084,270	772,102	513,163	327,013	222,776
Totals	9,161,331	11,281,030	10,892,438	7,762,825	4,959,108	3,210,036

II. PRODUCTION OF TRENTON ROCK PETROLEUM IN INDIANA FROM 1891 TO 1909, WITH VALUE.

	1891.	1892.	1893.	1894.	1895.	1896.
Total production (barrels of 42 gal.)	136,634	698,068	2,335,293	3,688,666	4,386,132	4,680,732
Total value at wells of all oils produced, excluding pipeage	$54,787	$260,620	$1,050,882	$1,774,260	$2,807,124	$2,954,411
Value per bbl	$0 40	$0 37	$0 45	$0 48	$0 64	$0 63

	1897.	1898	1899.	1900.	1901.	1902.
Total production (barrels of 42 gal.)	4,353,138	3,751,307	3,807,714	4,912,675	5,725,474	7,535,561
Total value at wells of all oils produced, excluding pipeage	$1,871,849	$2,228,276	$3,331,750	$4,740,731	$4,775,045	$6,450,440
Value per bbl	$0 43	$0 59⅜	$0 87½	$0 96½	$0 83⅜	$0 85⅝

	1903.	1904.	1905.	1906.	1907.	1908.
Total production (barrels of 42 gal.)	9,161,331	11,281,030	10,892,438	7,762,825	4,959,108	3,210,036
Total value at wells of all oils produced, excluding pipeage	$10,457,659	$12,127,107	$9,236,788	$6,877,863	$4,383,851	$3,121,639
Value per bbl	$1 14$\frac{3}{10}$	$1 07½	$0 84⅝	$0 88⅞	$0 88⅜	$0 97¼

From the first of the above tables it will be found by addition that the total production of Indiana Trenton rock oil for the 18 years reached the enormous sum of 93,278,192 barrels, which sold for $78,505,082, or an average of $4,361,393 per year.

In the third table there is shown the number of wells completed in the Indiana Trenton limestone fields by months from June, 1891, to January, 1909.

III. NUMBER OF WELLS COMPLETED IN THE INDIANA TRENTON LIMESTONE OIL FIELDS FROM 1891 TO 1909 BY MONTHS

YEAR.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1891							6	6	15	15	15	8	65
1892	11	13	18	13	17	19	17	30	25	52	33	47	295
1893	20	30	31	36	45	47	47	55	27	72	56	76	542
1894	90	103	103	80	110	107	84	123	100	107	97	85	1,189
1895	61	45	81	111	122	153	132	140	129	106	102	85	1,267
1896	76	90	86	136	148	150	113	121	70	58	66	66	1,180
1897	41	35	40	47	49	52	60	45	55	89	119	54	686
1898	41	23	29	43	38	55	53	80	72	82	92	86	694
1899	75	48	68	64	87	99	77	104	106	118	106	105	1,057
1900	113	67	98	148	165	163	158	155	135	152	118	108	1,580
1901	111	72	81	121	167	171	167	169	184	207	220	132	1,802
1902	176	113	169	182	247	297	288	279	323	295	320	243	2,932
1903	168	178	233	236	331	408	377	387	337	366	375	290	3,686
1904	235	157	234	202	296	393	394	383	378	388	320	344	3,724
1905	194	130	149	185	196	157	159	145	130	108	163	166	1,882
1906	135	90	84	68	106	142	120	100	93	69	66	59	1,132
1907	46	40	63	44	49	63	56	52	40	52	38	41	584
1908	29	17	28	19	28	35	35	39	44	38	33	31	376
Total													24,673

From this table we learn by subtraction that 208 fewer bores were sunk for oil in the Trenton rock fields of Indiana in 1908 than in 1907. This was a loss of 35.6 per cent, as against a loss in 1907 of 48.4 per cent over the previous year.

From the table it may also be learned that up to January 1, 1909, 24,673 bores had been drilled in the Trenton rock fields of Indiana for oil alone. On that date there were 13,301 producing wells in the Trenton rock fields, as against 15,210 on January 1, 1908, a loss of 1907 for the year.

By subtraction it will be noted that of the total number of bores sunk for oil in the Trenton rock fields of the State, 11,371 have proven dry, or have been abandoned as nonproductive. The number abandoned in 1908 was 2,157, or 647 more than in 1907, while the number of dry holes drilled during the year was 64, or 21 less than in 1907. Of the total number of bores sunk in 1908, 17 per cent were dry, as against 14.5 per cent of those drilled in 1907 and 10.9 per cent of those sunk in 1906.

The following table shows the number of producing wells, number of dry holes, total bores, average initial production of wells drilled, and number of wells abandoned in each of the Trenton rock oil producing counties of Indiana in 1907 and 1908:

COUNTIES.	Producing Wells, 1907.	Producing Wells, 1908.	Dry Holes, 1907.	Dry Holes, 1908.	Total Bores, 1907.	Total Bores, 1908.	Percentage of Dry Holes, 1907.	Percentage of Dry Holes, 1908.	Average Initial Output of Productive Wells, Bbls., 1907.	Average Initial Output of Productive Wells, Bbls., 1908.	Abandoned Wells, 1907.	Abandoned Wells, 1908.
Adams	30	13	3	2	33	15	9.1	13.3	5.7	13.6	125	82
Blackford	19	31	3	9	22	40	13.6	22.5	7.4	8.5	156	319
Delaware	49	15	16	14	65	29	24.6	48.2	14.6	20.8	330	205
Grant	103	83	12	7	115	90	10.4	7.7	7.5	9	418	657
Hamilton	0	1	3	0	3	1	100	0	0	10	4	0
Huntington	46	15	2	2	48	17	4.1	11.7	10.6	10.3	70	165
Jay	122	82	30	25	152	107	19.7	23.3	11.2	11	72	68
Madison	3	2	2	0	5	2	40	0	16.6	7.5	25	5
Randolph	3	4	2	1	5	5	40	20.0	18.3	8.7	71	45
Wabash	4	0	0	0	4	0	0	0	0	5	2	1
Wells	120	66	2	4	122	70	1.6	5.7	8.9	8.1	224	610
Totals	499	312	85	64	584	376	*14.5	*17	*9.7	*10.1	1,510	2,157

*Denotes average.

From the table it will be seen that in most of the counties the number of productive wells drilled was less than in 1907. Jay County continued to hold the lead in new work, a position which she took for the first time the year before. The average initial output of the new wells gained four-tenths of a barrel per well, which proves that the oil is still present and that the slump in the industry is due solely to the lack of drilling. In 1906 and 1907 there was a loss in initial output of six and four and nine-tenths barrels, respectively, per well.

In most of the counties there was a gain in the percentage of dry holes and the average rose from 14.5 to 17 per cent, due to the drilling on the borders of productive territory, rather than in the intervals among producing wells.

The great number of abandoned wells was largely due to the lack of gas in most localities for pumping small producers. Many of those abandoned would yield from one-half to one barrel per day and if gas had been available for power, they would have been kept in action at a profit for a year or two longer, but the cost of coal was prohibitive.

Unless some large strikes are soon made or the price of oil rises 25 or more cents per barrel, the future outlook is not encouraging for much activity in the Trenton rock area of the State. The only

other cause which would bring it about would be a great decline in the production in Illinois and Oklahoma and the chances for this are at present remote.

CORNIFEROUS ROCK PETROLEUM.

The "Corniferous rock" or Corniferous limestone is the oldest and lowest division of the Devonian system of rocks in Indiana. It ranges up to 65 feet in thickness and is immediately overlain by a thick bed of blackish or brownish shale, known as the New Albany or Genesee shale. This ranges up to 195 feet in known thickness, and forms the necessary impervious cover which has retained the oil of the Corniferous in the limestone in which it is found.

Petroleum in commercial quantities is being produced from the Corniferous rocks in Indiana at present only in or near Terre Haute, Vigo County, and in an ill-defined area in eastern Gibson and southern Pike counties, where several new wells were opened up in virgin territory during the year.

Vigo County.—A full and detailed history of the production of oil in this county up to January 1, 1907, was given in the thirty-first report of this department. This was followed by a brief record of the new developments and output for the year 1907 in the report for that year. Not a bore was sunk in the county during the year just past.

The Phoenix well, operated by Prox and Brinkman, and located near the center of the city of Terre Haute, still continues to yield a good supply of oil. This well was finished in May, 1889, and is the oldest and best paying oil well ever sunk in Indiana. For twelve or more years it yielded an average of 1,000 barrels per month. In the last few years this has gradually lessened, and in 1908 it averaged about 340 barrels per month. Two other wells, located but a short distance from the Phoenix, are producing oil from the same stratum at a depth of about 1,660 feet. One of these, known as the MeWhinney well, has been a small producer since it was finished in 1899, but was shut down during the greater part of the past year, and its total yield was only about 300 barrels. The other was completed by George C. Foulkes in May, 1907, and is located on a lot just across the street from the Phoenix. It started at only about 25 barrels, and the output was about the same as that of the MeWhinney well.

The total amount of oil produced from the three wells during the year was 4,637 barrels. This was sold to local consumers at an

average price of $1.09 per barrel, the whole amount received being $5,077.

In the so-called Riley field, ten to fifteen miles southeast of Terre Haute, but one bore was started during the year, and it has not yet been completed. It is located on the Clingerman lease about 800 feet south of the No. 1 or pioneer well of the Vi-Clay Company. During the year there were eight wells producing in the Riley pool, but their output was small as shown by the following table:

Number of Barrels of Oil Sold from the Riley, Vigo County, Pool by Months for the Year 1908.

January	1,652
February	1,096
March	2,246
April	1,075
May	1,616
June	1,083
July	1,536
August	1,617
September	1,070
October	532
November	1,595
December	1,105
Total	16,223

This was sold at the same price as the Trenton limestone oil, viz., 89 cents to the end of February and 99 cents for the remainder of the year; the total sum received being $15,787. Adding to this the amount received for the oil produced at Terre Haute, we have a total of $20,864 received for the Corniferous rock petroleum produced in the State in 1908.

Pike County.—The Indiana strike which caused most excitement among oil men in 1908 was one made in August by Messrs. Murphy and Heydrick, representatives of the Pure Oil Company. This was on the Yeager farm, northeast quarter of the southwest quarter section 26 (2 S., 8 W.), Monroe Township, Pike County, one-half mile west of the town of Arcadia; four miles southeast of Oakland City, Gibson County, and twelve miles south of Petersburg. This bore was sunk mainly on account of the fact that a fair showing of oil had been found in one of three bores put down between it and Arthur, a small town about two miles to the northeast.

One of these bores, located on the Burnett farm, about 1,500 feet northeast of the Yeager strike, completed April 27th, 1908, had also shown a gas pressure of 525 pounds. In it a vein of coal seven feet thick was found at a depth of 85 feet; a small showing of oil between 1,136 and 1,143 feet and the stratum yielding a large amount of gas between 1,146 and 1,157 feet.

The Yeager well started at about 30 barrels of oil per day, spouting the same at intervals on account of a high gas pressure.

A partial record of the well furnished by J. A. Lash, the superintendent, showed the strata passed through to be about as follows:

Record of Yeager No. 1 Well.

		Feet.	Feet.
1.	Surface, mud, loam and quicksand	52	52
2.	Coal measures, shale, coal, etc	408	460
3.	Sandstones (Mansfield and Huron)	410	870
4.	Limestone	30	900
5.	Shale	15	915
6.	Limestone	40	955
7.	Shale	10	965
8.	Limestone	70	1,035
9.	Shale	5	1,040
10.	Limestone	54	1,094
11.	Shale	46	1,140
12.	Limestone and shale	41	1,181
	Total depth		1,181

The first gas was found at a depth of 1,148 feet and the first oil at 1,162, the pay streak continuing unbroken to the bottom.

The record of the iron used in the well was as follows:

	Feet.
Drive pipe, 13-inch	52
Casing, 10-inch	303
Casing, 8-inch	960
Casing, 6¼-inch	1,074

The usual excitement following a strike in new territory ensued. Leases were taken in every direction, large bonuses being paid for those in the immediate vicinity. Up to February 1, 1909, the time of the writing of this report, nine additional bores had been drilled into or through the producing stratum, five of which were dry. Of the nine, six were in Monroe township, Pike County, two of these being dry, the others starting at 33 to 100 barrels each. Three of the producing wells were on the Moses Skinner lease,

southeast quarter of the northeast quarter, and southwest quarter of the northwest quarter of section 24 (2 S., 8 W.), about one and a half miles northeast of the Yeager well. A driller's record of these three bores showed as follows:

Record of Wells on M. Skinner Lease.

	No. 1. Feet.	No. 2. Feet.	No. 3. Feet.
Drive pipe, 12½-inch	57	73	98
Casing, 10-inch	320	....	....
Casing, 8¼-inch	785	510	490
Casing, 6¼-inch	1,055	1,057	1,080
Depth to top of sand	1,146	1,137	1,161
Depth to pay sand	1,154	1,149	1,173
Total depth	1,196	1,206	1,207
Production first 24 hours (bbls.)	33	75	35
Number quarts nitroglycerin used in shooting	40	60	100

Bore No. 3 showed quite a quantity of gas, the rock pressure being about 150 pounds.

On the Amelia Skinner farm, in the southeast quarter of the northeast quarter of section 27, Monroe Township, one-half mile northwest of the Yeager well, a bore completed on December 25th had the following record:

	Feet.
Drive pipe, 10-inch	60
Casing, 8¼-inch	417
Casing, 6¼-inch	1,067
Depth to top of sand	1,130
Depth to pay sand	1,139
Total depth	1,178
Initial production, bbls.	100

Gas was found in the sand between 1,130 and 1,139 feet. From 1,139 to 1,169 feet the sand was quite porous, and between these depths most of the oil was produced.

One of the two dry holes in Monroe Township was drilled on the Joel Skinner lease, northeast quarter of the northeast quarter of section 3 (3 S., 8 W.), about one and a half miles southwest of the Yeager well, and the other on the Gillum farm, southwest quarter of the northeast quarter of section 28 (2 S., 8 W.), two miles west of the Yeager well. A record of these bores showed:

Record of Bores on J. Skinner and Gillum Leases.

	Skinner.	Gillum.
	Feet.	Feet.
Drive pipe, 10-inch	117	50
Casing, 8¼-inch	376	330
Casing, 6¼-inch	1,109	1,120
Top of sand	....	1,186
Total depth	1,343	1,210

In the Gillum well a four-foot vein of coal was passed through at a depth of 154 to 158 feet, and another six feet thick at 190-196 feet.

Two dry holes were drilled in Warrick County in an endeavor to trace the oil stratum of the Pike County wells southward. One of these, on the John N. Miller lease, southeast quarter of the northwest quarter of section 19 (5 S., 8 W.), Boone Township, is reported to have passed through the following strata:

Record of J. N. Miller Bore.

		Feet.	Feet.
1.	Surface, loam and shale	..	40
2.	Shale	20	60
3.	Lime and shale	25	85
4.	Shale	20	105
5.	Fire clay	15	120
6.	Black shale (cave)	10	130
7.	Black shale	13	143
8.	Coal	6	149
9.	Hard shale	3	152
10.	White shale	50	202
11.	Black shale	20	222
12.	Fire clay and shale	100	322
13.	Shale and shells	11	333
14.	Limestone	3	336
15.	Coal	5½	341½
16.	Shale and shells	48½	390
17.	Limestone shells	25	415
18.	Brown shale	50	465
19.	White shale	102	567
20.	Brown shale	50	617
21.	Shale and shells	100	717
22.	Black shale	50	767
23.	Lime shells	20	787
24.	Gray shale	40	827
25.	Black shale	10	837
26.	White sand (full of salt water)	70	907

		Feet.	Feet.
27.	White shale	40	947
28.	Brown shale	100	1,047
29.	Shale	218	1,265
30.	Brown lime	15	1,280
31.	Black shale	12	1,292
32.	Red cave	8	1,300
33.	Soft black shale	23	1,323
34.	Salt sand, yielding salt water	60	1,383

A driller's record of the iron used showed:

	Feet.
Drive pipe, 12½-inch	40
Casing, 11-inch	78
Casing, 8¼-inch	882
Casing, 6⅝-inch	1,055
Casing, 5 3/16-inch	1,323
Depth to sand	1,323
Total depth	1,383

The sand was full of water and caved very badly.

The other dry hole in Warrick County was on the Jessie Barkley lease in the southeast quarter of the northeast quarter of section 21 (4 S., 8 W.), Hart Township, its record showing:

	Feet.
Drive pipe, 10-inch	60
Casing, 6¼-inch	900
Casing, 4⅞-inch	1,070
Total depth	1,310

A very slight showing of oil occurred at 1,220 feet.

In Center Township, Gibson County, a bore which came in dry was drilled on the land of Anna Hawles, southeast quarter of the southwest quarter of section 36 (2 S., 10 W.), about four miles southwest of Francisco. The strata passed through as recorded by the drillers were as follows:

Record of Bore on Hawles Farm Near Francisco.

		Feet.	Feet.
1.	Surface silt and sand	.....	65
2.	Mixed mud and gravel	65 to	80
3.	Soft shale	80 to	150
4.	Coal	150 to	155
5.	Soft shale	155 to	195
6.	Coal	195 to	200
7.	Soft light shale	200 to	445

		Feet.		Feet.
8.	Coal	445	to	448
9.	Light shale	448	to	715
10.	Coal	715	to	717
11.	Brown shale	717	to	735
12.	Gray sand	735	to	750
13.	Black shale	750	to	825
14.	Gray sand	825	to	835
15.	Coal	835	to	837
16.	Black shale	837	to	870
17.	Gray sand, coarse	870	to	885
18.	Salt sand and water	885	to	890
19.	Shale	890	to	900
20.	Gray sand	900	to	940
21.	Shale	940	to	1,070
22.	Salt sand	1,070	to	1,100
23.	Shale	1,100	to	1,120
24.	Salt sand, water	1,120	to	1,180
25.	Shale	1,180	to	1,254
26.	Salt sand, water	1,254	to	1,325
27.	Shale, hard sandy	1,325	to	1,327
28.	Shale	1,327	to	1,340
29.	Sand	1,340	to	1,360
30.	Shale	1,360	to	1,368
31.	Red rock	1,368	to	1,370
32.	Shale	1,370	to	1,382
33.	Limestone, caved	1,382	to	1,445

In the bore a plentiful supply of good water was found between 65 and 80 feet, and a small amount of gas at 335 feet. The Princeton oil-bearing stratum was struck at 840 feet, but was barren.

It is very probable that the formation in which the oil occurs in the Yeager and Skinner wells is the Corniferous limestone, or the same horizon in which the oil near Birdseye, Dubois County, about 35 miles to the east, was found in 1902 and 1903. In the Birdseye wells the average depth to the pay streak was 980 to 1,010 feet below the surface. Fourteen bores were sunk near Birdseye, seven of which came in as light to fair producers, but they were too far apart, one from another, to pump with profit, and as a consequence the field was abandoned.

While the high gas pressure in the Burnett and other wells in this part of Indiana indicates the near presence of quite a large quantity of oil, the chances are that it will be found in small, isolated pools, and that its development will show a very spotted area resulting in a large percentage of barren bores.

Huron Sandstone Petroleum.

Petroleum from the Huron sandstone, one of the upper formations of the Subcarboniferous or Mississippian period, has been produced for a number of years near Princeton, Gibson County, and was formerly produced near Loogootee, Martin County. A full account of the Princeton field to January 1, 1907, with accurate detailed map, was prepared by R. S. Blatchley and published in the 1906 report of this department. Up to the beginning of the year 1908, 195 bores had been sunk in the Princeton field. Of these 47 were wholly dry and 11 were abandoned after producing a short time, leaving 137 producers on January 1, 1908. During the year 1908 only nine bores were drilled in the field, two of which were dry. The average initial output of the seven producers was 12.8 barrels. No one of the new wells increased the limits of the known productive area to any great extent.

The output of the Princeton field by months for the years 1904 to 1908, inclusive, is shown in the following table:

Number of Barrels of Huron Sandstone Oil Piped or Shipped from the Princeton Field in the Years 1904 to 1908, Inclusive, by Months.

	1904.	1905.	1906.	1907.	1908.
January	1,412	4,043	8,026	9,163	7,470
February	1,399	3,637	6,127	9,875	7,799
March	2,920	5,400	7,322	9,534	8,257
April	1,319	5,262	9,033	7,713	8,114
May	2,047	5,559	8,463	10,894	7,073
June	2,315	4,523	10,201	10,209	7,021
July	2,971	5,569	9,498	9,693	6,346
August	2,991	6,296	9,429	11,029	7,029
September	3,345	6,141	9,469	8,484	5,661
October	3,093	6,865	9,312	11,372	7,242
November	4,554	6,116	8,294	10,056	6,158
December	3,841	5,395	8,382	8,957	5,942
Totals	32,207	64,806	103,843	116,979	84,112

By subtraction the loss in the field for the year was 32,867 barrels, or 28.1 per cent, as against a gain of 13,136 barrels, or 12.6 per cent, in 1907. Of the amount produced in 1908, 56,054 barrels were sold to the Indiana Pipe Line and Ohio Oil companies at an average price of 68 cents per barrel, the price being 31 cents lower than that paid for Trenton rock oil during almost the entire year. The remainder, amounting to 28,058 barrels, was sold to independent purchasers at an average price of 89.2 cents per barrels, the total value of the oil produced in the Princeton field being $63,145 for the year.

WILDCAT BORES OUTSIDE THE AREAS MENTIONED.

A number of test bores were put down in western and southern Indiana outside the counties mentioned during 1908. No one of these produced anything more than a slight showing of gas or oil. As far as we have records these bores were as follows:

Putnam County.—One on the Bower's lease, section 28 (16 N., 5 W.), Russell Township, about four miles southeast of the town of Russellville. This bore was sunk by Crawfordsville parties to a depth of about 800 feet, or about 50 feet into the Corniferous limestone. A good flowing well of sulphur water and a slight showing of gas were the only results.

Parke County.—A bore was sunk by Brazil parties to a depth of 1,200 feet near Diamond, in the southern part of this county, but was wholly dry.

Sullivan County.—Four dry holes were completed in the western part of this county during the year. Two were in Gill township on the Gill and Springer leases; one in Fairbanks township on the Russell lease and one in Turman Township on the Dunham farm. The latter one was drilled to a depth of 2,100 feet.

Knox County.—Two test bores were completed in this county during the year. One on the Emison farm in Busseron Township, five miles south of Oaktown, was sunk to a depth of 1,700 feet without results. The other, on the Chipson farm near Orville, was abandoned at 1,600 feet with no showing whatever of either oil or gas.

Greene County.—This county had four dry holes to its credit during the year. They were located near Clayton, Ben Harrison, Graywinkle and Burns City. In no one of these or the other tests drilled in the southwestern part of the State in 1908 was the bore sunk to the Trenton limestone. To thoroughly test any locality in Indiana it should pierce this formation at least 300 feet. No oil has ever been found in the State between the Corniferous and the Trenton and if a bore is sunk to the Corniferous it is money thrown away to drill deeper unless it is intended to go to Trenton, which lies 850 to 1,000 feet below the Corniferous.

Bores were also completed in Martin County near Rutherford and in Daviess County near Odon, both of which came in dry.

Clark County.—A bore which was drilled clear through the Trenton limestone was put down on the the grounds of the American Car and Foundry Company at Jeffersonville. In it the top of the Jeffersonville or Corniferous limestone was the surface rock, being struck at a depth of 32 feet. The top of Trenton was found

at 855 feet and that of the St. Peter's sandstone at 1,550 feet, showing the Trenton to be 695 feet in thickness. The drilling continued in the sandstone to a depth of 1,800 feet. Fresh water was struck at 40 and 90 feet, and brackish or salt water at 1,550, 1,645, 1,700, 1,710, 1,725, 1,770 and 1,785 feet. No Magnesian limestone, a formation usually found separating the St. Peters and Potsdam sandstones, was shown in the records furnished. The St. Peters was therefore 250+ feet thick, or a greater thickness than heretofore reported from the State.

* * *

Adding to the output of the Trenton rock petroleum fields that produced by the Corniferous limestone at Terre Haute and Riley, and by the Huron sandstone at Princeton, we find the total production and value of petroleum in Indiana for the last five years to be as follows:

TOTAL PRODUCTION AND VALUE OF CRUDE PETROLEUM PRODUCED IN INDIANA IN THE YEARS 1904 TO 1908 INCLUSIVE.

	1904.		1905.		1906.		1907.		1908.	
	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.
Trenton Rock Petroleum	11,281,030	$12,127,107	10,892,438	$9,236,788	7,762,825	$6,877,863	4,959,108	$4,383,851	3,210,036	$3,121,639
Corniferous Rock Petroleum	18,103	21,040	12,064	13,270	7,269	8,456	27,210	21,867	20,860	20,864
Huron Rock Petroleum	32,405	28,951	64,806	55,413	103,843	81,770	116,979	83,495	84,112	63,145
Total	11,331,538	$12,177,098	10,969,308	$9,305,473	7,873,937	$6,968,089	5,103,297	$4,489,213	3,315,008	$3,205,648